Royal Society of Victoria.

ANNIVERSARY ADDRESS

OF

The President,

MR. ELLERY (*Government Astronomer of Victoria.*)

[Delivered to the Members of the Royal Society, at the Anniversary Meeting held on the 2nd July, 1866.

GENTLEMEN OF THE ROYAL SOCIETY,

I esteem it a great honour that I have been elected to assume the office of your President this year. In that capacity it now devolves on me to address you on the subject of the progress of your Society during the past year, and, following the good example of the older scientific societies of the mother country, give a brief retrospect of the progress in this colony and other parts of the world of those branches of knowledge embraced by your Society.

But, in the first place, it becomes my mournful duty to record the loss of one of your oldest and most energetic members, John Macadam, Doctor of Medicine in the University of Glasgow.

Dr. Macadam died on the 2nd of September, 1865, on board the steamship *Alhambra*, on his way to New Zealand, to which colony he was proceeding on professional business. He had been for a long time previously in bad health, induced in a great measure by the incessant and harassing

duties pertaining to the various offices he held, and much increased by an accident, causing fracture of the ribs, he met with on his return from New Zealand, a short time previously.

Dr. Macadam was born at Northbank, near Glasgow, in May, 1827. He first studied under Professor Penny, at Glasgow, to whom he was afterwards appointed principal assistant. He subsequently entered at the Edinburgh University, under Professor Gregory. He arrived in this colony in 1855, under an engagement as Lecturer on Chemistry and Natural Science in the Scotch College, Melbourne. Dr. Macadam was one of our earliest members of the Philosophical Institute of Victoria, afterwards the Royal Society. He held the office of Honorary Secretary for many years, and on him devolved the task of editing the "Transactions," all of which, except the last issued, were published under his superintendence. He was also a Fellow of the Royal Scottish Society of Arts, and a Fellow of the Faculty of Physicians and Surgeons of Glasgow. Of late years he held the appointment of Lecturer on Theoretical and Practical Chemistry, at the Melbourne University, which he retained till the time of his death.

Although your last session was not a very busy one, several interesting and valuable papers were read, giving rise in many instances to animated and instructive discussions.

Numerous and valuable additions were made to your library by kindred societies abroad; and we are now in regular receipt of the "Transactions" of ninety-five scientific and literary bodies in Europe and America.

The resumption of the publication of the "Transactions," which had for several years unfortunately been in abeyance, is a noteworthy fact of your last session. The last volume which was issued to your members contains the Transactions

of the Society during the years 1861-62-63, and 64. Arrangements have now been made that will, I trust, prevent our work getting thus into arrears for the future. It very frequently happens that it is of great importance that papers and communications read before this Society should be published without delay, in some cases to secure priority of discovery, and often to make known useful information. Your Council have, therefore, decided to publish the papers at least once a quarter.

At the first meeting of the Society in May, your late President, the Rev. Dr. Bleasdale, gave his inaugural address. An instructive and suggestive paper by Mr. Thomas Harrison, entitled "Victoria as a field for Geologists," was read at the next meeting on the 22nd May.

At the June meeting, Dr. Bleasdale laid before the Society his report on the Exhibition of Colonial Gems and Jewellery, and Works of Art in the Precious Metals, which had taken place a short time previously.

A paper entitled "The Probable Erosion of the Mountain Ranges of Gipps Land," was also read by your late Secretary, Mr. Thomas Rawlinson. A most interesting discussion followed the reading of this paper, which related principally to the denudation of the mountain lands of that district, and the formation of the alluvial plains to the southward of them. At the same meeting, I also gave a short account of the application of Spectrum Analysis to the Heavenly Bodies.

At the next meeting a most important paper "On the Skeleton of the Gorilla in the National Museum," was read by Professor Halford, which will be perused with interest by all engaged in the study of comparative anatomy. The comparisons of the human skeleton with that of the gorilla and many other apes was most exhaustively discussed. You are aware, gentlemen, of the difference of opinion that

exists among our most eminent comparative anatomists and osteologists on this subject. Professor Halford takes ground in opposition to Professor Huxley's views, and although I believe few of us will venture to ally ourselves to any particular side of the moot points, the paper will form a valuable addition to our knowledge of comparative anatomy.

Professor M'Coy read a paper at our meeting on the 14th of August, in which he announced for the first time with certainty, the existence of the Cretaceous formations in Australia. Some fossils which had been brought down from the head of the Flinders river, by Messrs. Carson and Sutherland, which were laid before the meeting, had enabled Professor M'Coy to arrive, without doubt, at this conclusion. This discovery, Professor M'Coy told us, nearly fills up the great series of marine mesozoic formations supposed to be absent in Australia when he arrived here, but most of which he has recognised and demonstrated from palæontological evidence before the meetings of our Society.*

The last papers of the session were "On the desirability of working the Ethnographical and Geographical Section of the Society," by Mr. Rawlinson; and a very ingenious but speculative one entitled "Probable Astronomical Causes of the Contortions of the Palæozoic Strata in Australia," by Mr. Harrison.

At the annual closing meeting of the session, some important alterations were made in the laws of the Society, which past experience had shown to be desirable.

Intimately connected with the progress of the Society is the advancement and well-being of our public scientific establishments, and to these and their results during the past year I would now briefly advert.

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* Professor M'Coy informed me a few days since, that Mr. Sutherland had just sent him most important new fossils confirming the above, which he intends shortly to bring before the Society.

The Geological Survey, under the direction of Mr. Selwyn, one of your members, has made considerable progress. There has been, however, a less number of those splendid maps produced than usual, in consequence of most of the field surveyors having been appointed in 1864 to examine certain portions of the colony which were hitherto unexplored. Their very interesting reports on these districts are now in course of publication.

During the past year, however, they were recalled, to continue their regular field works, the director having selected for survey "those lines of country" which he considered, if carefully mapped, would be most likely to afford valuable data and information on several very important points affecting the probable auriferous character of untried reefs, and the extension into new ground of deep leads now working, as well as the existence of others not yet developed.

The labours of the survey during the past year in this direction, especially in the elaborate and carefully-worked survey of portions of the Moorabool valley, near the Steiglitz gold-field, "have enabled them to arrive at conclusions which, if true, are not only geologically interesting, but may become of great value in preventing useless outlay of capital and labour. There appears, however, a very general indisposition on the part of mining investors in the colony to accept the conclusions or to be guided by the deductions and experience of the scientific geologist, and his advice and opinion, though frequently asked for, is seldom acted on if it differs from that of the working miner. Even in the short history of Victoria, instances are not wanting in which thousands of pounds would have been saved had an opposite course been taken."

A report of the various examinations and experiments conducted by Mr. Newbery, analyst to the geological

survey, will be found to contain valuable and interesting matter. The investigations concerning the nature and productiveness of the water of the salt lakes will be continued, also those in connection with the possible manufacture of hydraulic and other cements,—both of which are not unlikely to become important industries of Victoria.

During his recent examination of the upper portions of the Yarra gold-fields, and of other districts, especially of Eastern Gipps Land, Mr. Selwyn has been enabled to make several important additions to the geological sketch-map of the colony.

Emanating from this department is a report by Mr. Ulrich, assistant geological surveyor, on the Freiberg Silver-mining Company, St. Arnaud, containing some generally interesting and very valuable observations on the argentiferous lodes of that district.

Mr. Selwyn has examined the Western Port and Cape Paterson coal-fields, and reiterates his former opinion of the improbability of a really good workable coal-field ever being found in that district. He states that "there are one or two places some miles from Cape Paterson and Griffith Point where it might be advisable to make a few borings; but he entertains very little hope of even these, if carried out, leading to the discovery of any really profitable workable coal-field. The ground is, however, untested, and while a chance of a successful result remains it should not, in his opinion, be neglected."

Mr. Campbell, of Traralgon, has discovered excellent coal among the river drift in the bed of the River Tyers, but not the seam from which it is derived, "which can easily be found if carefully sought for. If it occurs sufficiently thick and extensive to work profitably, it would undoubtedly prove most valuable." Mr. Selwyn proposes visiting the locality shortly, to ascertain the probable extent and

thickness of those seams of coal already discovered, and also whether there are not others of better quality existing in the neighbourhood.

The Botanical department, so ably conducted by one of our members, Dr. Ferdinand Mueller, claims a place in our notice of scientific progress. By his continuation of local phytographical researches, Dr. Mueller has afforded to the president of the Linnæan Society the necessary aid for writing the third volume of the universal work on Australian plants. The *Fragmenta Phytographiæ Australiæ*, which have from time to time been presented to our society as they issued from the press, have now reached to the fifth volume. The *Hortus Siccus* of the Botanical Museum has received an important addition in the original typical collection of the late James Drummond, of Swan River, whose researches for over twenty years have familiarized botanists with the flora of the south-west portion of this continent.

The addition of a laboratory to the Botanical department, for purposes of chemical and technological inquiry into the value of various vegetable products in the colony, is a step in the right direction. There is ample field for such research, and I hope our Society will duly be made acquainted with the results of these inquiries. It will be interesting to you to know that Dr. Mueller has now succeeded in raising a large number of the cinchona or Peruvian bark trees, as well as plants of ginger and arrowroot, and others of great commercial value, during the last year. He is now prepared to commence plantations of these in fitting parts of our mountain lands, as soon as the necessary financial aid shall be afforded.

The importance of establishing plantations of the cinchona cannot be well over-estimated, for the indiscriminate stripping of the trees in the South American forests, com-

bined with other causes, has so limited the supply from that part of the world, that the establishment of this plant in other localities has become an absolute necessity.

The immense consumption of quinine and other products of the cinchona bark, in India and tropical climates especially, and the great commercial value which these materials have attained, have resulted in the formation of extensive plantations in the Neilgherry Mountains, which have thriven beyond expectation. I have no doubt many of you will recollect Dr. Markham's expedition into the cinchona forests of South America, in order to obtain plants and seeds for those plantations, and the great difficulty and danger he incurred in getting those he collected to the seaboard.

In astronomy, meteorology, and magnetism, our Observatory has kept its accustomed watch. During the past year its efforts have been principally directed to the completion of a catalogue of stars—now in the printer's hands—which includes most of the work done at Williamstown prior to the removal of the Observatory from that place to Melbourne, as well as the publication of the astronomical work for the years 1863, 1864, and 1865.

Some years ago, Dr. Argelander, the director of the Observatory at Bonn, completed the task of surveying the northern heavens, and forming a catalogue of all stars down to the ninth and tenth magnitude, thereby giving the positions of nearly half a million stars. The completion of this undertaking forms one of the greatest practical achievements in modern astronomy. The Royal Astronomical Society of London, fully alive to the value of this work, determined to try to get a survey of the southern heavens, on the same elaborate scale, by British means, and finally this honourable task was allotted to the Royal Observatory at the Cape of Good Hope, the Madras Observatory, and the Melbourne Observatory. The preparations necessary for commencing

this work by the beginning of the current year have also occupied much of the attention of the officers of the establishment. In February last, the survey was fairly under way. The portion of the heavens that it is proposed shall be surveyed by our Observatory will occupy many years, and as it intended that our part shall be completely reduced to mean places for a fixed epoch, the necessary calculations and reductions will tax the present staff rather heavily.

A self-registering anemometer, on Dr. Robinson's principle, and similar to that used at the Royal Observatory, Kew, was added to the appliances of the establishment last year, and now daily yields its faithful and continuous record of the velocity and direction of wind, and their changes. Arrangements have been made for adopting self-registering instruments for meteorological and magnetic records, as far as possible; which will, of course, not only relieve the department of a large amount of mere routine work, but render the registration of the several phenomena incomparably more complete than they could possibly be from observations at stated intervals.

Professor M'Coy, in his presidential address in 1864, dwelt at some length on the subject of the great Southern telescope, and on the action your society had taken respecting it in former years. It will, therefore, I think, be of some interest to you to hear of the progress that has been made in this matter. At the time of Professor M'Coy's address, the munificent offer by Mr. Lassels of his great reflecting telescope to the Melbourne Observatory had just reached us, and it was fully expected that this famous instrument would have been by this time erected in Melbourne, our Legislature having voted a sum of money to cover the cost of conveyance and of some necessary alterations to fit it for these latitudes. Subsequent correspondence,

however, between the Board of Visitors to the Melbourne Observatory and the Royal Society of London, led the board to recommend that Mr. Lassell's offer should be declined. This recommendation was acted upon, and the additional amount necessary to obtain a new telescope of the most suitable construction was afterwards voted by Parliament. You will be glad to learn that the new telescope is now being constructed by Mr. Grubb, of Dublin, and, it is fully expected, will arrive by, or shortly after, the beginning of next year. It will be of the form known as the Cassegrainian ; the large speculum will be four feet diameter, and about thirty-five focal length ; the tube is to be of open lattice-work of steel. It will be mounted equatorially, and driven by clock-work. An apparatus for repolishing the speculum will accompany the telescope. The whole cost is to be £4,500 in Dublin.

While speaking of the scientific work going on in the colony, outside the Royal Society, the geodetic and coast surveys require some notice. The latter undertaking, under Commander Cox, R.N., has made considerable progress. The more tedious parts of the survey—namely, our two principal harbours, Port Phillip and Western Port—have been completed ; and the magnificent chart of the former, which came out from the Admiralty some months since, is sufficient evidence of the complete way in which the admiralty surveyors, under Captain Cox, perform their work. The survey is now being extended along the coast line east of Western Port.

The geodetic survey, under my superintendence, has also made considerable progress. The principal operations of scientific interest during 1865 were the completion of the primary triangulation westwards to the South Australian boundary, and its advance into the Australian Alps in the north-east portions of the colony, and its extension along

our coast line eastwards as far as the entrance of the Gipps Land Lakes. The maps of this survey are now considerably advanced, and a new map of the colony, based on the accurate determination of the surveyors employed, is in progress.

There have been some important improvements and extensive additions made during the past year to our national museum. The half of the museum building erected by order of Parliament two years ago, adjoining to the University, contains a very fine hall about 150 feet by 60, lofty, well lighted, and ventilated, yet perfectly free from the dirt and dust of the town, owing to the extensive planted grounds surrounding it. The students of the University are referred daily to the various collections for illustrations of the scientific lectures; and of the general public, 78,536 visited the building last year. In this way the best practical and general use is made of the collections, of which upwards of 100,000 specimens are now fully classified and named by the director, Professor M'Coy.

The ground floor on the north-east side contains a nearly perfect collection of minerals, all carefully labelled, after testing, with their chemical composition in symbols and system of crystallisation, in addition to the name of the locality, giving the greatest facility for study. On the same side of the hall is a magnificent collection of skeletons, from those of the gorilla down to the fishes, including elephant, whale, manatu, and several hundred others, most instructively arranged in zoological series; and a commencement has been made of a novel plan for facilitating the study of osteology in the museum, by marking the various bones with a number corresponding with the anatomical name of the part set for that length in inscriptions on the walls. On the north-west side the floor contains the tertiary quadrupeds, the bones of which may thus be compared with those of the living allies.

The whole of the south half of the floor is occupied by the mining and metallurgical illustrations, all very fully labelled and illustrated for public instruction. The collection of models of mining machinery far exceeds that of the Government School of Mines in London, and was intended by Professor M'Coy to facilitate the establishment of a school of mines.

A handsome gallery runs round the room, on which the zoological collections are arranged according to a new plan, by which the laws of representative species and centres of creation are well illustrated. The great zoological regions of the earth, in accordance with the most recent researches, are inscribed on the walls; and the collections of the inhabitants of each kept by themselves, each group zoologically arranged and fully labelled with order, family, genus, species, and locality. The collections of Central and South America occupy the west gallery, those of Central and South Africa the east gallery, Central and South Asia the north, Oceanica, &c., the south gallery, &c.

Amongst the more interesting additions made last year, are the finest series of the old and young gorillas known, with their perfect skeletons; bones of the dodo, sent by our former president, Sir Henry Barkly, to Professor M'Coy; laniary teeth of Thylacolea, from near Geelong; a splendid series of the Psittacidæ, newly collected by Mr. Wallace in the islands north of Australia; a specimen of Forster's great Penguin, of which so few examples exist; and the only known specimen of the *Pithecia Wurmbi*, which approaches in the head far nearer to man than the orang, chimpanzee, or gorilla; and lastly, the most perfect specimen known of that excessively rare and interesting object, the *Pentacrinus caput-medusæ*, the last living type of the stalked crinoidæ of geological early times.

Our Public Library, too, has acquired additional attrac-

tions. Besides a large increase in its literary treasures, the picture gallery has been much enriched, more especially by the acquisition of some beautiful paintings by Guerard, Chevalier, and Gritten. The Museum of Art has also been further developed, and the ground floor is now almost exclusively occupied by copies of the best works in sculpture, not only of the modern schools, but including also faithful casts from the Elgin and other Greek marbles.

The successful casting of the Burke and Wills monument by Mr. Summers is another noteworthy fact of our progress. Few know the enormous trouble and pains the production of this immense bronze casting cost this courageous artist, from the time of his first shaping his model in clay to the time the statue was lifted on its pedestal. Not only does it reflect great credit on its author as a splendid work of high art, but also as an achievement in bronze-founding on a large scale.

The Acclimatisation Society has been steadfastly progressing in its useful labours. Prominent among the results of the year are the importation of a flock of that most valuable animal, the Angora goat, and the completion of the arrangements for another consignment of salmon ova, of whose safe arrival a few weeks ago you are no doubt aware.

The further exploration of the interior of Australia is in progress. The expedition fitted out under the auspices of the ladies of Victoria, assisted by a personal donation from Her Majesty the Queen, and further aided by contributions from the Governments and people of the neighbouring colonies, with the predominant view of unveiling, if possible, the fate of Leichhardt, under the leadership of Mr. M'Intyre, is exploring the more northerly portions of the Australian continent. Even should this search be barren in its primary object, the information which must inevitably result from

the travels of the expedition will in some measure repay the ladies of Victoria for their chivalrous undertaking.

With the year's history of the Royal Society of Victoria and of our various scientific establishments, it cannot escape our notice how much progress has been made in the colony generally. In the mechanical arts we especially notice a healthy and steady advancement. Our foundries and engineers' establishments are constructing railway, marine, and mining machinery of a class and at a cost that promises soon to compete with our great factories at home. Manufactories are being rapidly established among us. Many chemicals, for which there is a large demand in the colony, are now manufactured here on an extensive scale. Earthenware and pottery are produced in large quantities, and great improvement is perceptible in the quality of the productions during the last year. The distillation of essential oils from our eucalypti, the manufacture of perfumery, and the utilisation of the grass tree, from which alcohol and a most useful gum resin are obtained in large quantities, are now being carried on profitably; and time is only needed to render these undertakings the fountains of special productions, which will add much to the commercial prosperity of our adopted country.

Before concluding, I must not omit to give a brief retrospect of the progress of science in the western world. So many items of the greatest interest appear, if we glance over the science harvest of 1865, that I must content myself with a reference to only the most salient points.

In the great advancement that has been made in physical science, the one subject that seems to stand out beyond all the rest is the result of the continued researches into heat and radiation, by Tyndall and others. One point of prominent interest in connection with this branch of science appears to have been determined—namely, that the sun's

rays pass through space without loss, and only become developed as heat as they enter our atmosphere, the density and humidity of which govern the amount developed. Such being the case, it does not seem improbable that, however distant a planet may be from the sun—whether near or far—whether it be Mercury or Neptune, it receives the same amount of heat as the Earth, the character of their enveloping atmospheres entirely governing the supply. The researches of Messrs. Huggins and Thompson, and Father Secchi in Florence, on the spectra of the heavenly bodies, have also ripened into most interesting results. The examination of several of the nebulæ by Mr. Huggins with the spectroscope has led to the opinion that they are "gaseous masses," giving light of similar refrangibility to that of nitrogen. A similar examination of Jupiter has led Father Secchi to the impression that his atmosphere has a far higher light-absorbing power than that of the Earth. He thus advances towards the proof required to what I have just mentioned concerning heat-rays traversing space without loss, and that the planets probably have atmospheres so constituted, according to their position in space, as to render the light and heat received in some degree equal for all. Through the application of spectrum-analysis to the planets, stars, nebulæ, and comets, we are led to believe that many of our views concerning their condition will need considerable modification. It has generally been believed that the moon possessed no atmosphere; all evidence pointed always to that conclusion. Mr. Huggins, however, has observed that the spectrum of a fixed star undergoes a change at the moment before occultation by the dark limb of the moon characteristic of the passage of the star's light through an atmosphere.

Mr. Sorby has much improved on his method of spectrum-analysis by the microscope, and has successfully applied it to the detection of blood-stains.

Chemists have been, as usual, very active. The new metals with which spectrum-analysis has made us acquainted have been fully investigated, and various sources from which they can be obtained have been discovered. The new method of Mr. Crookes, of increasing the amalgamating power of mercury by the use of the metal sodium, has been rendered much more complete, and stripped of many of the objections which at first attended it. The priority of using sodium for this purpose seems, however, to have another claimant, a Mr. Wurtz, who, according to American authorities, was the first to use it.

Graham's theory of the diffusion of gases has been applied most beneficially to practical purposes. Instruments, not unlike aneroid barometers, are now constructed on principles first indicated by this great investigator, by which the presence of firedamp in collieries can be at once detected, and thus its dangerous effects provided against.

The most remarkable fact in the progress of geology in the western world seems to be Mr. W. Logan's discovery of a fossil zoophyte, of the order of Foraminifera, in rocks hitherto considered to have been azoic or devoid of life remains, being, geologically speaking, older than our Silurian and Cambrian formations, which have always been looked upon as the oldest of our sedimentary rocks. The fossil alluded to, is called the *Eozoon Canadense,* and was found in what are known to geologists as the Laurentian rocks of Canada.

The discovery of flint and other instruments, undoubtedly the work of man, in the drifts and in limestone caves, indicates to geologists the existence of the human race further back into time than our history reaches. These discoveries have been made in many parts of Europe and in the East. The implements are chiefly of flint or stone, and have frequently been found associated with the remains

of animals which have no longer an existence on the earth. These interesting discoveries, which have been greatly added to during the past year, have been widely discussed ; but further researches to clear up points now obscure and doubtful are needed before the best authorities will venture on any general conclusions as to the antiquity of man.

The discovery of bituminous shales and clays seems to be spreading over the whole world, and that in New South Wales promises to be a large source of wealth to those concerned in it.

In conclusion, gentlemen, I return for a moment to the affairs of this Society.

I congratulate you on what I believe to be the most important step during your last session, namely, that your council, aided by a small grant from Government of £175, have been enabled to print the papers which had accumulated for several years, and on their decision that for the future the proceedings shall be printed at short intervals. It will be fatal to our well-being and progress to let the works of your members lie by unpublished. I would urge you, therefore, to consider the carrying into effect this decision as essential, I would almost say, to the very existence of the Society. Nor must we always look to a Government grant for the means of doing so, and I believe, with economy and care, we shall be able to do so out of the revenue of the Society.

We cannot blink at the fact that this Society is numerically far less strong than it was some years back. It has been passing through an ordeal like that which all societies of this kind must inevitably go through in a new country. When the novelty wears off, then the work begins. We started as the Philosophical Institute of Victoria, but we grew ambitious, and obtained the privilege of styling ourselves the Royal Society of Victoria. There were far more aspirants

to the title of member of the Royal Society than that of member of the Philosophical Institute, but as time wore on many of these dropped behind. The annual amount of subscriptions dwindled down to a small and easily-managed income, till only those who cared about the Society for its own or for science's sake remained. And although I cannot say we are in a very prosperous condition financially, I still believe our Society is in a healthier state than it was in its apparently more popular days. The few that have stedfastly gone on with the work of the Society under the most adverse circumstances, are now being gradually reinforced by members whose motives for joining are, I believe, more substantial than those which influenced the many who have left our ranks. If we wish to succeed, and make this the foundation of what it may become in the future, a great, and perhaps the greatest, scientific body in the southern hemisphere, we must not sink its real objects—namely, the cultivation of science, literature, and art—in our efforts to increase our revenue by indiscriminately swelling our member-roll, or in attempting to make it too popular.